

AMENDMENTS TO THE SPECIFICATION

Please make the following corrections to the specification:

Please replace paragraph [0017] with the following amended paragraph:

[0017] A first filter is preferably a second or third order high pass filter with a frequency response curve of 12 db/octave slope or 18 db/octave slope for the lower frequencies, respectively. One of the purposes of the first filter is to substantially reduce lower frequency intermodulation distortion by means of such filtering. The first filter also has at least some user-selectable corner frequencies in its frequency response curve so that the user may customize the tonal quality of the signal processor. The first filter preferably also includes at least two adjustable gain levels with overlapping gain characteristics that may be pre-set by the user and that may be alternately selected. The multiple, user-preset, selectable gain levels allow the user to adjust the amount of distortion present in, and therefore the tonal color of, the processor output.

Please replace paragraph [0018] with the following amended paragraph:

[0018] The output of the first filter is input to one or more limiting gain stages, which are in series or cascade configuration. These gain stages can increase the amount of distortion present in the processor output. Oppositely poled diodes in the feedback circuits of the amplifiers in the gain stages limit the output amplitude of the amplifiers and contribute to the distortion characteristics of the signal processor. Preferably, the gain stages have an additional or second feedback circuit that introduces a controlled amount of hysteresis, a nonlinear distortion, in the amplification characteristic of the gain stages. Thus, when the gain stages are overdriven by the input signal, the clipping or distortion in the output signal of the gain stages will be enhanced.

Application No. 10/623,433
Attorney Docket No. 1451-0001

Please replace paragraph [0038] with the following amended paragraph:

[0038] The present invention of a signal processing circuit, generally designated 40, is shown in block diagram format in FIG. 1. An input signal is received at an input terminal 41 to a small magnitude output impedance stage 43. Stage 43 preferably has an output impedance that is significantly smaller than the input impedance of a first filter k1 44 so as not to materially affect the corner frequencies of the first filter 44. First filter 44 is a complex filter with multiple user-adjustable corner frequencies and passband gains. The output of filter 44 is input into a first gain stage 45. The output of the first gain stage 45 is input into a second gain stage 46. The output of the second gain stage 46 is input into a second filter k2 47, which provides the output signal of the signal processing circuit 40 at a terminal 42.

Please replace paragraph [0043] with the following amended paragraph:

[0043] A single double pole, double throw switch 75 selects one of two networks that are also connected to node 65. In the position shown in FIG. 3, switch 75 selects the first network that includes a pair of resistors 66 and 68. Resistor 68 may be in the form of an adjustable resistor or potentiometer with an adjustable terminal 67 to control the amplitude of the signals provided through filter 44. If switch 75 is in the opposite position from that shown in FIG. 3, the second network consisting of resistor 70, capacitor 69 and variable resistor or potentiometer 73 is selected. This second network also provides control of the amplitude of the signals provided through filter 44 by varying the position of the adjustable terminal 72 of variable resistor 73. In addition, capacitor 69 provides some additional filter effects over that of the first network consisting of resistors 66 and 68.

Application No. 10/623,433
Attorney Docket No. 1451-0001

Please replace paragraph [0051] with the following amended paragraph:

[0051] FIG. [[9]] 7 is a composite of the frequency response graphs of FIGS. 4-6. The frequency shifts of some of the corner frequencies have not been illustrated, as in FIGS. 4-6, for purposes of simplifying this composite graph. It will thus be appreciated that the above-described differing techniques for customizing the frequency response characteristics of the first filter 44 provide the ability to customize or fine tune any portion of the audio frequency spectrum, as desired by the user.

Please replace paragraph [0052] with the following amended paragraph:

[0052] The preferred embodiment of an amplifier for the first gain stage 45 in FIG. 3 is shown in FIG. 8. An input terminal 88 of the first gain stage 45 passes input signals through a resistor 89 and a capacitor 90 to a node 97. Node 97 is connected via a feedback resistor 91 to the output terminal of an op amp 98 and via a resistor 96 to the inverting input of op amp 98. The non-inverting input of op amp 98 is referenced to ground. Feedback components, including a capacitor 94 and a resistor 95, are connected from the inverting input to the output of op amp 98. Oppositely poled diodes 92 and 93, also connected from the inverting input to the output of op amp 98, keep the op amp output amplitude limited. Diodes 92-93 clip symmetrically and therefore tend to limit the amount of distortion when the op amp 98 is overdriven. Diodes 92-93 also tend to provide some nonlinear distortion such as hysteresis when op amp 98 is overdriven since the feedback capacitor 94 will be charged by conduction of diodes 92-93. However, when diodes 92-93 become non-conductive, the impedance seen by feedback capacitor 94 increases and capacitor 94 takes longer to discharge. Thus, the first feedback circuit consisting of diodes 92-93, capacitor 94 and resistor 95 operates in two different impedance modes, depending upon whether diodes 92-93 are conductive or non-conductive.

Please replace paragraph [0053] with the following amended paragraph:

[0053] The amplifier embodiment of FIG. 8 has superior performance characteristics when used in signal processors for guitars. It is desirable for the best tonal characteristics resulting from clipping caused by gain stage 45, when overdriven, that the clipping not be symmetrical. To this end, a second feedback circuit, consisting of resistors [[88]] 89 and 91 and capacitor 90, creates additional nonlinear distortion such as hysteresis in the response of the gain stage 45. Resistor 96 provides some interaction between the first feedback circuit consisting of resistor 95, capacitor 94 and diodes 92-93, and the second feedback circuit. This additional nonlinear distortion such as hysteresis provides further distortion of the input signal by gain stage 45 when the op amp 98 is overdriven.

Please replace paragraph [0057] with the following amended paragraph:

[0057] The second filter stage, generally designated 47, is shown in FIG. 11. An input terminal 116 receives input signals from the output terminal of the second gain stage 46. Input terminal 116 is connected via a resistor 117 and capacitor 118 to a node 122. A resistor 119 and a capacitor 120 are connected in series between node 122 and ground. Node 122 is also connected via a resistor 121 to another node 127. A resistor 123 and a capacitor 124 are connected in series between node 127 and ground. Also separately connected in parallel between node 127 and ground are a capacitor 125 and a potentiometer 126. The variable wiper arm of potentiometer 126 is connected to the output terminal 42 of the signal processor 40 of FIG. [[3]] 2. Potentiometer 126 may function as the volume control for the signal processor.

Application No. 10/623,433
Attorney Docket No. 1451-0001

Please replace paragraph [0062] with the following amended paragraph:

[0062] An alternative frequency response curve 141 is shown in FIG. 14 for the first filter 44, instead of the frequency responses shown in FIGS. 4-7. In this embodiment, frequency response curve 141 has a slope of 12 db/octave at the lowest frequencies instead of 18 db/octave below the corner frequency f_1 in FIGS. 4-7. Curve 141 also does not have the high frequency rolloff of -6 db/octave for the higher frequencies, such as above the corner frequency f_4 in FIGS. 4-7. Characteristics of curve 141 can be provided by eliminating capacitors 53 and 83 in the schematic of filter 44 in FIG. 3. For example, short circuiting of capacitor 53 will eliminate the additional 6 db/octave of slope at the lowest frequencies of interest, thereby also eliminating the corner frequency f_1 . Elimination of capacitor 83 will also eliminate the corner frequency f_4 in FIGS. 4-7 and the -6 db/octave rolloff for frequencies above f_4 . However, since capacitor 83 also contributes to the stability of op amp 80, it may be desirable to simply decrease the capacitive value of capacitor 83 such that the corner frequency f_4 is above the frequencies of interest, and which effectively increases the passband of 0db/octave slope. A first filter 44 with the frequency response characteristics of FIG. 14, instead of with the frequency response characteristics of FIGS. 4-7, will provide sufficient attenuation of the lower frequencies prior to amplification by the gain stages [[44]] 45-46 to minimize IMD frequency products in many applications.